Remarks

The Amendments

Claims 1, 4, and 13 have been amended to correct the bases for the rejections of these claims under 35 U.S.C. §112. It is believed that each of the instances of insufficient antecedent basis has been deleted or corrected. Accordingly, it is requested that these rejections be reconsidered and withdrawn.

Independent claims 1 and 13 have also been amended to more clearly state the invention. These independent claims have been limited to methods of stamping articles from aluminum alloy sheet materials that are strain hardenable. The methods are applicable to the stamping of articles where the shape of the article cannot be stamped into the sheet without exceeding a straining limit of the sheet and tearing it or marring it. Thus, the claimed methods comprise a first stamping step in which a preform shape is made and a second stamping step in which the article shape is formed from the preform shape.

The first stamping step starts with a softened aluminum alloy sheet. This stamping step forms a preform shape that approaches the article shape without damaging the strain-hardened metal. The claimed methods require that such a preform shape be predetermined based on the stress/strain forming properties and the thickness of the sheet. The preform shape includes at least one strain-hardened region, but the hardened region is not strained to the point of tearing or wrinkling. The preform shape is then annealed in at least the strain-hardened region to re-soften that region. This practice is disclosed in paragraph 0006 of the specification and in the detailed description of a preferred embodiment. The strategically softened preform stamping is then stamped into the article shape.

The method of Claim 13 also includes cooling of the annealed preform and lubricating the preform.

Thus, independent claims 1 and 13 recite methods for stamping an initially soft, but stain-hardenable, aluminum alloy sheet into a shaped article. The stress-strain forming properties of the sheet metal and the article shape are used in determining a preform shape that will have a strain-hardened region. And at least that region of the preformed sheet is annealed to re-soften it. The preformed is then stamped into the final shape of the article.

The Claim Rejections

Claims 1, 3, 5, 7 and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Mitra (US Patent 6,033,499). Claims 9, 11, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mitra in view of Baumann et al (US Patent 6,344,096). Claims 2, 4, 6, 8, are rejected under 35 U.S.C. 103(a) as being unpatentable over Mitra in view of Futamura et al (6,003,359). Claims 10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mitra as applied to claims 2, 4, 6 and 8 above, and further in view of Baumann. The Examiner is respectfully requested to reconsider and withdraw these rejections as applied to the amended claims for the following reasons.

Reasons for Allowing Claims 1-14.

The Mitra '499 patent does not anticipate the methods of independent claims 1 and 13, or of the dependent claims 3, 5, and 7. Mitra starts with an age-hardened aluminum alloy sheet. The hardened sheet 10 is stretched into a cavity of die 12 over a die radius 38 by actuation of a punch 32. Punch 32 has a sheet forming surface 40 and a radius 36 at the periphery of surface 40. Some of the age-hardened sheet material (region B) is stretched over punch radius 36 and die radius 38. Thus, region B of sheet 10 is severely worked by the drawing process. The metal in region B is bent, unbent, and thinned as it is stretched over the two radii. But another region of the sheet material (region A) is just pulled across the face surface 40 of the punch. Mitra softens age-hardened metal in region A so that less stress from region B is required to stretch the region A metal. The Mitra practice helps the stretch forming of the age hardened material, but the Mitra disclosure does not anticipate or suggest the methods recited in claims 1 and 13.

Mitra does not disclose a method comprising stamping a preform of a specified article shape from a softened sheet of strain hardenable aluminum alloy. Mitra does not disclose annealing at least a strain-hardened region of the preform to re-soften the strain-hardened region. Mitra does not stamp an annealed preform shape to an article shape. Mitra does not predetermine a region of a stamping of a strain-hardenable aluminum alloy that will require annealing before a second stamping step can be performed. Mitra does not disclose any step of the methods recited in any of claims 1-14. Mitra heat treats a blank not a preformed stamping.

Mitra softens a region of an age hardened aluminum sheet material for use in a continuous stretch forming operation. And the region of his age hardened sheet that Mitra softens is a region that is not expected to experience severe strain. The Mitra disclosure does not anticipate or suggest the methods of claims 1-14, and no combination the Mitra disclosure with the disclosures of the Baumann et al '096 patent or the Futamura '359 patent teach or suggest applicant's claimed methods.

Baumann et al (hereinafter Baumann) disclose methods for producing different families of aluminum alloy sheets including the 5XXX series of alloys. But Baumann does not disclose how to stamp complex article shapes into the strain-hardenable sheets.

The Futamura et al (Futamura) patent discloses a deep drawing apparatus for deep drawing sheet stock, such as a suitable steel sheet material. The Futamura process produces deep drawn cups and tubes. As stated in the subject application, work hardenable aluminum alloys are not as formable as steel alloys used for such deep drawing operations. And it is not expected that strain hardenable aluminum alloys could be deep drawn into such cups and tubes by the methods of claims 1-14. The stamping practices of claims 1-14 require an evaluation of an article shape to be formed and a predetermination of a region within the article that cannot sustain the required strain to produce the shape. A preform shape is conceived that approaches the article shape with out experiencing an excessive stain. The preform is formed, the stained region is annealed and a second stamping step performed to reach final article shape. Futamura simply anneals the entire workpiece in his deep draw apparatus.

Futamura does not cool the annealed part and lubricate it for stamping as recited in independent claim 13.

Mitra and Futamura both pertain to drawing operations on sheet materials. But Mitra pertains to age hardened aluminum alloy materials, Futamura pertains to soft readily drawn steel alloys. Mitra selectively softens a region of his aluminum sheet material that will not be severely stressed. Futamura anneals his whole steel workpiece. No combination of these disclosures teaches or suggests the methods of independent claims 1 and 13 or of the claims that are subordinate to them.

Each of the rejections of each of claims 1-14 should be withdrawn. These claims should be allowed and this case passed to issue.

Respectfully Submitted,

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I hereby certify that this correspondence is, on the date shown below, being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on 3/27/06.

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